REMARKS

The Office noted claims 1-8, 12-14, 17, 19-21, 23-30, 33, 35, 36, 40-44, 47-53, and 134 to be pending; claims 1-8, 12-14, 17, 19-21, 23-26, and 53 withdrawn; and claims 27-31, 33, 35, 36, 40-44, 47-52, and 134 finally rejected.

35USC103

Office rejects claims 27-30, 35, 36, 40-44, 47-52, and 134 under 35USC103(a) as being unpatentable over McGee (US5,785,779) and further in view of RD'421059, Harpell (US5,198,280), and Harpell (US4,623,574, newly cited). McGee RD'421059 and Harpell '280 applied as in the office action of Dec. 12, 2003.

Applicant reiterates its prior remarks regarding 103 rejections and the prior art, including in particular its response to the office action of Dec. 12, 2003, and remarks further as follows.

Applicant explained in its previous communication that the amended claim 27 incorporates the limitation of canceled claim 31 in the form of a coating of polymeric material that penetrates the fabric, but does not harden beyond about a 10,000 psi bulk modulus as described in the specification. The Office has responded with new grounds for rejection in which it expands on its previous rejection, and in particular regarding the Applicant's claimed coating (e.g. amended claim 27), further cites McGee in combination with Harpell's '574 low modulus coating as a basis for the rejection, *absent a conclusive showing of unexpected results*.

Applicant first objects to the combination. The Office refers to the "broad range of the invention" as a premise for reaching the same conclusion. Applicant objects. Claim 27 has some very specific limitations, including: a puncture-resistant layer shaped as a belt that fits in a tire, a woven fabric with a round packed cover factor of at least 40% in warp and 65% in fill, the fibers have a tenacity of less than 15 g/denier, the woven fabric has a coating of polymeric material that penetrates into and occupies at least a portion of the void space between fibers, the coating upon hardening has a bulk modulus not exceeding about 10,000 psi. How can the conclusion that it is a

broad claim be asserted as the basis for using the combination which is then used as the basis for the conclusion?

Moreover, there is no teaching, suggestion or motivation apparent to the Applicant for combining the art of Harpell's '574 with that of McGee. The subject matter of the '574 is not related to the Applicant's work. This prior art is about the use of unwoven laid yarn strictly for ballistic use. For example, at col. 13, line 35, Harpell teaches that the use of laid yarn is preferred over wovens for development of rigid ballistic panels, which could be said to teach away from the instant invention. The discussion of filament winding in columns 6 and 7 further reinforces this as non-woven work, not informing of the instant invention. The wovens that he does teach are not successful in the instant application because even the small amount of twist noted at column 13, line 40 prevents the complete coating with the resins he is using, as is distinguished from the claimed invention. This also makes the use of the very tight high twist wovens of the Applicant's invention totally incompatible with the teaching of Harpell 574. Further, Harpell requires that its yarn be coated in advance of any assembly, again distinguished from the invention.

The resistance to small diameter puncture that results from the claimed coating in the Applicant's work is the result of a very different fiber matrix and resin interaction. The ballistic work may be governed by some pressure wave effects that are damped by the structures that Harpell is teaching. The fine penetrator effect here is not governed by these same effects, and indeed the structures are not even related. The applicant's structure is a woven fabric of inherently high crimp and high twist, with a coating applied after weaving. Harpell teaches none of this art.

Further proof of this lack of connection to the Harpell teaching is the rigid heavy high mass of the structures that he teaches. A review of the '574 patent shows more than a dozen samples and examples of laminates The lowest mass Harpell works with is 2.90kg/m2 (see his table 2 and table 7) in general his structures are from 5-8kg/m^2. These rigid panels are from

between 3 and 8mm thick and are not suitable for any high flex applications as in the case of a tire liner. How can a 3-8mm panels work in an application where the Applicant is teaching a structure that is 0.2-0.4mm thick? The Harpell disclosure does not in any way evident to this Applicant, teach, suggest or motivate the creation of the thin, light, puncture resistance structure of the invention.

Harpell teaches un-twisted, un-crimped, yarn-dipped, non-woven, 3-8mm thick rigid laminates. It is not teaching about high-twist, high-crimp, fabric-coated, tightly woven 0.2-0.4mm thin flexible fabrics in belt form. Therefore Harpell art does not combine with the teaching of McGee '779. How could the unrelated work on rigid, non-wovens ballistic resistance structures inform work on thin, flexible bicycle tire applications? The tire work taught in Magee is by the nature of the application a very flexible material of much less than 3mm in thickness. Any attempt to combine Harpell's '574 art with the McGee would either result in no puncture resistance or no flexibility. The mere recitation by the Office of casual references in this art to overlapping fields of general application is not sufficient to support the invocation and association of this newly cited art as a combined basis for the rejection. Applicant urges its withdrawal.

Unexpected Results

Not withstanding the above remarks, Applicant offers the following related information, supported by the accompanying Rule 1.132 Declaration of inventor Charles A. Howland, in direct response to the Office's page 4 invitation to provide a conclusive showing of unexpected results relating to the bulk modulus for overcoming the 35USC103 rejection.

The primary purpose of Mr. Howland's declaration is to explain why the puncture resistance results achieved with the claimed invention for a tire anti-puncture device, particularly with respect to the use of coatings that penetrate into the void space between fibers of the fabric and have a bulk modulus of not more than 10,000 psi as claimed, were unexpected and would not have been obvious prior to the invention, and certainly not obvious in the context of the cited prior art of McGee, RD'421059, Harpell'280, and Harpell'574.

According to the Applicant, the performance of this invention is governed by puncture mechanics not previously well understood in the art. There are a series of interactions with the woven fiber and the various coating materials that is not in any way obvious, and contradict the Office's assumption that one skilled in the art would have been able to merely predict or select the correct modulus. Based on the objectives of the invention and the materials in question, a simple additive theory of each material's puncture resistance qualities would be expected to yield at least a useful expectation of their combined performance. For example, using 0.05 steel needle test method where:

- Uncoated fabric (UCF) puncture resistance in lbf =UCF
- Coating (C) puncture resistance in lbf = C
- Cover layer (CL) lbf =CL
- System performance predicted (SSP) would be expected to yield approximately the sum of the three:

SPP=UCF+C+CL

The optimization to which the Examiner alluded, with respect to a flexible puncture resistance material based on the McGee and other cited art in the rejections would then be based on selection of fabrics and coatings that have very high puncture results in their respective classes. Unexpectedly, this is not the result that was obtained in the Applicant's testing.

Example #1

- 70/2 arimid fabric of 73x70 epi construction (style/1094)
- Coated and saturated with an approximately 2000 psi modulus nylon
- Felt cover layer
- Uncoated fabric puncture performance for s1094 UCF= 0.35lbf
- Coating puncture performance C < 0.05
- Cover layer CL=1.73
- Addition based performance prediction SPP=2.1
- System performance, Actual (SPA) SPA=4.28

As can be seen from this example the result in simple addition would be a puncture resistance of SPP= 2.08lbf. (lbf = pound foot) However, as shown above, the actual puncture

performance is SPA = 4.28; greater than twice the expected result. This is seen even when the coating has a very low modulus and negligible performance on its own. The affect of even a soft matrix resin on a puncture resistance significantly increases the affect of the woven design in this respect. Keep in mind that the coating, as stated in the claims, must penetrate into and occupy at least a portion of the void space between fibers for the fabric, in order to achieve this result.

Example #2

- 50/2 x 25/2 aramid fabric of 110x63 epi construction (style/1123)
- Coated and saturated with approximately 3500 psi modulus acrylic coating filled with carbide grain
- Uncoated fabric puncture performance for s1123 UCF=2.18
- Coating puncture C < 0.1
- System performance predicted SPP = 2.28
- System performance actual SPA = 4.71

As in the first example the results of a very soft matrix has an amplifying or multiplicative impact on the system performance. These results are not anticipated from the Applicant's experience with harder higher modulus coatings. To use a coating that has little or no intrinsic puncture resistance to improve the resistance of the system would not be expected to yield these results. However in combination with fabrics of enough cover with the correct coating method as claimed, this unexpected improvement in puncture resistance can be achieved.

Example #3

- 50/2 x 25/2 aramid fabric of 110x63 epi construction (style/1123)
- Coated *but not saturated* with approximately 3000 psi modulus acrylic coating

- Uncoated fabric puncture performance for s1123 UCF=2.18
- Coating puncture C < 0.05
- System performance predicted SPP = 2.2
- System performance actual SPA = 2.4

As can be seen in this example if the coating is not allowed to penetrate and form a matrix with the woven, as claimed, the results of the first two examples is not achieved. The test

results are consistent. It is concluded that the interaction of soft coatings over the small dimensions in the fiber voids changes the characteristics of the individual components to yield the resulting, unexpected improvement in system behavior. For this reason, Applicant requests reconsideration of the rejected claims.

Applicant asserts again that it can find no where in the cited references a teaching, suggestion or motivation to produce the claimed device, or to combine the cited references in any manner that obviates the claimed device, particularly in light of the unexpected results supported by the Howland declaration. McGee's material as described cannot perform in this fashion. McGee's epoxy coating mentioned at col. 4, lines 40-45 is not taught as or suggestive of a coating of limited hardness as is here claimed. Both of Harpell's '280 and '574 are non-analogous art, the '280 decorated as it is with hard panels or "planar devices" that are simply incompatible with the application to which this invention is directed. Neither of these is a likely candidate for combination with the other references for the instant purpose.

Improper Designation as a Final Action

The Examiner has indicated that this office action is final. Applicant respectfully submits that it was improper for the Examiner to make this action final for at least the following reasons.

MPEP § 706.07(a) states that second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is not necessitated by an Applicant's amendment of the claims. The Examiner is kindly reminded that the "applicant who is seeking to define his or her invention in claims that will give him or her the patent protection to which he or she is justly entitled should receive the cooperation of the examiner to that end, and not be prematurely cut off in the prosecution of his or her application." MPEP § 706.07 (present practice does not sanction hasty and ill-considered final rejections).

In this particular case, the amendment to claim 27 pertained to a coating claimed in original claim 38 and for which there is support in the specification. Further, Examiner has

introduced art, Harpell's '574, not sufficiently related to either the original claim or the amendment to support the rejection.

Accordingly, it was improper under MPEP § 706.07(a) for the Examiner to make this action final. Applicant respectfully requests the Examiner to withdraw the finality of this action and enter the enclosed response as a matter of right.

Telephone Interview

Present Office policy places great emphasis on telephone interviews initiated by the examiner. For this reason, it is not necessary for an attorney to request a telephone interview. Examiners are not required to note or acknowledge requests for telephone calls or state reasons why such proposed telephone interviews would not be considered effective to advance prosecution. However, it is desirable for an attorney to call the examiner if the attorney feels the call will be beneficial to advance prosecution of the application. MPEP§408

Applicant respectfully requests swift consideration of these remarks and its accompanying declaration explaining the unexpected results regarding the specified range of bulk modulus of base claim 27, and the indulgence of a further informal communication regarding this submittal, preferably by telephone, so that the Applicant can take such further action as may be required to maintain and advance the state of this prosecution.

Respectfully submitted,

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